

# Combination of biological and chemical pesticides more effective than expected on malaria mosquitoes

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A combination of fungal spores and chemical insecticides are an effective way of combating insecticide-resistant malaria mosquitoes. Researchers at Wageningen UR and from Benin, West Africa, have shown that fungi and insecticides reinforce each other's efficacy, and that the effect of using a combination of both is greater than the sum of using the two methods separately. Their article in the August edition of *PLoS One* claims that biological and chemical methods of fighting malaria can and should be used together.

It is estimated that world-wide, more than a million people die from the effects of malaria. Most of them live in the poorer African countries. Malaria parasites are transmitted from person to person by the Anopheles mosquito. In many areas, particularly West Africa, malaria [mosquitoes](#) are becoming increasingly resistant to [chemical pesticides](#), and so the effect of impregnated mosquito nets and indoor sprays is wearing off. Last year, researchers from Wageningen showed that [fungal spores](#) were effective in killing mosquitoes and that they could even make the mosquitoes more vulnerable to pesticides. They therefore carried out follow-up research on the efficacy of combinations of fungi and insecticides against resistant malaria mosquitoes in West Africa.

## Reinforced effect

For the first time, the Wageningen researcher Marit Farenhorst and

colleagues from the Entomology Research Centre in Cotonou, Benin tested fungi on [malaria mosquitoes](#) that had become resistant to the commonly-used insecticides DDT and permethrin on location. Fungal spores from *Beauveria bassiana* and *Metarhizium anisopliae* proved effective in killing both laboratory-bred and wild mosquitoes. In addition, they studied the efficacy of fungi in combination with insecticides.

A [fungal infection](#) made the wild mosquitoes more vulnerable to permethrin, and exposure to permethrin reinforced the efficacy of the fungi. Simultaneous exposure to both fungi and insecticides had the greatest impact on the insecticide-resistant mosquitoes. The effect was even higher than expected and proves that fungi and permethrin enhance each other's efficacy

## Long-term effect

As well as reinforcing each other, the combination of fungi and insecticides also has potential to be effective in the long term. It is more difficult for mosquitoes to become resistant to two totally different control agents. Furthermore, the researchers recognize that chemical malaria control methods are still very important in numerous countries. For this reason, they conclude that it would be better to use fungi as an additional method rather than a replacement. Future research will focus on evaluating methods whereby mosquitoes are exposed to both fungi and [insecticides](#) in one night, for example by using a combination of impregnated mosquito nets and fungal spays inside the house.

**More information:** Farenhorst M., Knols B.G.J., Thomas M.B., Howard A.F., Takken W., Rowland M. and N'Guessan R.K., 2010. Synergy in efficacy of fungal entomopathogens and permethrin against West African insecticide-resistant mosquitoes. *Public Library of Science ONE*, 5 (8).

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